[redacted]

ECE340
10317

HOMEWORK 09

Distributions of the sum of two ind. normals:

Distribution of two ind. Poissons:

1) Student A:
   MATH → Mean 1000pts & std dev. 100pts
   LANG → Mean 500pts & std dev. 10pts.
Student B:
   MATH → Mean 1,200pts & std dev. 20pts
   LANG → Mean 400pts & std dev. 20pts
☆ The college requires above a 1650 in an entrance test (which is the sum of the two ind. normals). ☆
Which student is more likely to get in?

A $\begin{cases} \mu = 1,000, & \sigma = 100 & \sigma^2 = 10000 \\ \mu = 500 & \sigma = 10 & \sigma^2 = 100 \end{cases}$ $\Big\rangle \sqrt{10100} \cong 100.5$

B $\begin{cases} \mu = 1200, & \sigma = 20 & \sigma^2 = 400 \\ \mu = 400 & \sigma = 20 & \sigma^2 = 400 \end{cases}$ $\Big\rangle \sqrt{800} \cong 28.2$

A: $P(X \geq 1650) = P\left(Z \geq \frac{1650-1500}{100.5}\right) = 1 - P\left(Z \leq \frac{1650-1500}{100.5}\right)$

$\Rightarrow 1 - P(Z \leq 1.49) = 1 - .9319 = \boxed{0.0681}$

$P(Y \geq 1650) = P\left(Z \geq \frac{1650-1600}{28.2}\right) = 1 - P\left(Z \leq \frac{1650-1600}{28.2}\right)$

$\Rightarrow 1 - P(Z \leq 1.77) = 1 - .9616 = \boxed{0.0384}$

Student A is more likely.

2) $P(X+Y=k) = \sum_{i=0}^{k} P(X+Y=k, X=i) = \sum_{i=0}^{k} P(Y=k-i, X=i)$

$= \sum_{i=0}^{k} P(Y=k-i, X=i)$

$X+Y \sim P(\mu+\gamma)$

So $\mu=2$ & $\gamma=1$ $\quad k \geq 2$

$P(X+Y \geq 2) = 1 - P(X+Y<2) = 1 - P(X+Y=0) - P(X+$

$= 1 - \frac{(2+1)^0}{0!} e^{-(2+1)} - \frac{(2+1)^2}{1!} e^{-(2+1)} = 1 - e^{-3} - 3e^{-3}$

$= 1 - 4e^{-3} = \boxed{0.8008}$